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The financial content of inflation risks in the euro area

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ABSTRACT

Recent studies have emphasized that survey-based inflation risk measures are informative about future inflation, and thus are useful for monetary authorities. However, these data are typically only available at a quarterly frequency, whereas monetary policy decisions require a more frequent monitoring of such risks. Using the ECB Survey of Professional Forecasters, we show that high-frequency financial market data have predictive power for the low-frequency survey-based inflation risk indicators observed at the end of a quarter. We rely on MIDAS regressions for handling the problem of mixing data with different frequencies that such an analysis implies. We also illustrate that upside and downside risks react differently to financial indicators.

1. Introduction

Assessing inflation risks is key to the conduct of monetary policy. With this in mind, central bankers regularly resort to surveys of professional forecasters (SPF) to monitor the central tendency in the distribution of future inflation, typically through mean point forecasts. Ang, Bekaert, and Wei (2007) emphasize that the so-called consensus forecast, i.e. the average of professionals' mean point forecasts of inflation, is indeed a very good predictor of future inflation realizations. More recently, Andrade, Ghysels, and Idier (2012) developed new survey-based inflation risk indicators which rely on quantiles extracted from individual subjective distributions of future inflation to measure the risk of extreme inflation realizations. They show that these measures are complementary to the usual consensus forecast extracted from surveys, as they allow for a distinction between upside and downside inflation risks, as well as providing information about future inflation outcomes, in addition to the usual consensus forecast.

Thus, SPF data are an important source of information for assessing the risks to future inflation. However, they suffer from an important drawback; namely, they are only available at a low frequency, typically every quarter. By contrast, monetary policy decisions require a continuous monitoring of macroeconomic conditions. As a matter of fact, central banks also regularly use high frequency financial market data in their decision-making processes. In this paper, we investigate whether such financial market data are informative for the various survey based inflation risk measures, and hence can be used in order to predict survey-based inflation risk measures between two subsequent quarters. In addition, and as a byproduct of this analysis linking inflation risk indicators to financial variables, we can also get a sense of the economic information conveyed by these inflation risk measures.

More specifically, we resort to the Mixed Data Sampling regression (MIDAS) of Ghysels, Santa-Clara, and Valkanov (2002) to deal with the problem of handling data of different frequencies implied by this empirical exercise. We consider a set of seven daily financial variables that covers the main dimensions of financial markets: oil prices, stock

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prices, exchange rates, money markets, and bond markets. We assess the predictive power of each variable on a set of five quarterly survey-based inflation risk indicators: a measure of the central tendency of the future inflation distribution, a measure of the extremely high inflation risk, a measure of the extremely low inflation risk, a measure of the uncertainty of future inflation, and a measure of the asymmetry of the risk to inflation. We compare both in-sample and out-of-sample forecasts of the models using the different financial variables with the usual autoregressive and random-walk models. We also look at the information provided by the whole set of financial indicators we consider by constructing forecasts combining the forecasts produced using the individual models.

We emphasize the following three main results. First, past financial market data have a significant impact on measures of inflation risks. Second, and related, this impact differs across indicators. In particular, upside and downside risks react differently to the same financial variable. Thus, financial indicators contain information about the inflation risk *uncertainty* and *asymmetry*: observed changes in several financial indicators lead, not to a simple upward translation of the whole distribution of inflation risks, but to changes in the way in which the risks are distributed around this central tendency. Put differently, the results illustrate that the MPF's assessment of the perceived inflation risks is incomplete. Third, daily financial variables help to predict the inflation risk indicators both in-sample and out-of-sample. MIDAS regressions using financial data systematically present in-sample root mean squared errors (RMSE) which are lower than those from either a simple autoregressive model or a random walk model. Moreover, we also show that, for some risk indicators, a simple average of the forecasts drawn from each single financial indicator MIDAS regression can reduce the out-of-sample root mean squared forecast errors (RMSFE) by up to 13% compared to the random walk model, and by up to 15% compared to a pure autoregressive model. All in all, our results emphasize that high frequency financial data provide information about the evolution of the inflation risk indicators at a frequency that is higher than that given by surveys.

Our paper is also related to the studies investigating whether or not financial variables help to predict future inflation. Stock and Watson (2003) find that they are of little help, while Bryan, Cecchetti, and Wiggins II (1997) and Cecchetti (2008) find the opposite. However, these studies do not consider financial data of a higher frequency than the forecasted inflation rate, while Monteforte and Moretti (2010) do. They rely on the MIDAS methodology to show that financial data can reduce the forecasting errors of the euro-area inflation rate, and therefore are useful in characterizing the inflation risk, as measured by the average point forecasts of the future inflation rate. Our approach is complementary to theirs, as we consider the impact of high frequency financial variables on survey-based inflation risk measures.

Our results showing that high frequency financial variables help to forecast inflation risk measures connect this paper to the work of Ghysels and Wright (2009), who predict the mean point inflation forecasts of professionals in the US using financial variables. It is also related to the forecasting literature, where the mixing sampling methodology and the information content of financial market data have been used to improve the forecasts of macroeconomic variables, typically the growth rate of GDP, as for instance in the work of Galvao and Clements (2008) and Marcellino and Schumacher (2008).

Our work is also linked to papers which aim to measure and understand inflation risks beyond the central tendency of future inflation distribution. For instance, Engle (1982) focuses on the second moment of future inflation, Garcia and Manzanares (2007) also look at the asymmetry of the distribution of future inflation, and Christensen, Lopez, and Rudebusch (2011) estimate deflation probabilities. We investigate the impact of financial variables on each of these three dimensions of the distribution of future inflation.

Finally, and more generally, this study shares some features with the work of Andrade and Le Bihan (2010) and Coibion and Gorodnichenko (2012), who aim to understand and characterize the formation of expectations by looking at surveys.

The remainder of this paper is organized as follows. In Section 2, we present the survey-based inflation risk measures we consider. Section 3 describes the MIDAS methodology. Details of the dataset that we use are given in Section 4. We provide and discuss the estimation of the MIDAS regressions in Section 5. Section 6 is devoted to the analysis of the in-sample and out-of-sample performances of the models using daily information from financial markets. We conclude in Section 7.

2. Survey-based measures of inflation risk

How does one characterize and measure inflation risk? Most often, studies have resorted to using the central tendency in the distribution of future inflation. A standard survey-based measure of this central tendency is the so-called *consensus* forecast, i.e., the average of mean point forecasts (MPF) across individuals, namely:

$$\mathrm{MPF}_t^h = E_i(m_{it}^h),$$

where E_i is the expectation across individual forecasters i, and where m_{it}^h denotes the mean point forecast of inflation made by individual i at date t for a forecasting horizon of h quarters.

However, as Kilian and Manganelli (2008) argue, mean point forecasts do not provide the full set of information in which a central banker would be interested when he/she has asymmetric preferences on inflation risks. They advocated a risk management approach to monetary policy, according to which policy decisions are taken with respect to not only mean point forecasts of inflation, but also estimates of potential extreme inflation realizations. The question then is how to measure extreme inflation risks. One answer is provided by Andrade et al. (2012), who developed such measures, based on survey data. These *inflation-at-risk* indicators (I@R) complement the standard MPF indicator. In particular, they enable us to make the distinction between upside and downside risks explicitly, i.e., to depart from the assumption that the risks are balanced. Moreover, Andrade et al. (2012) show that these